

Trend Study 30-3-03

Study site name: Upper Broad Hollow.

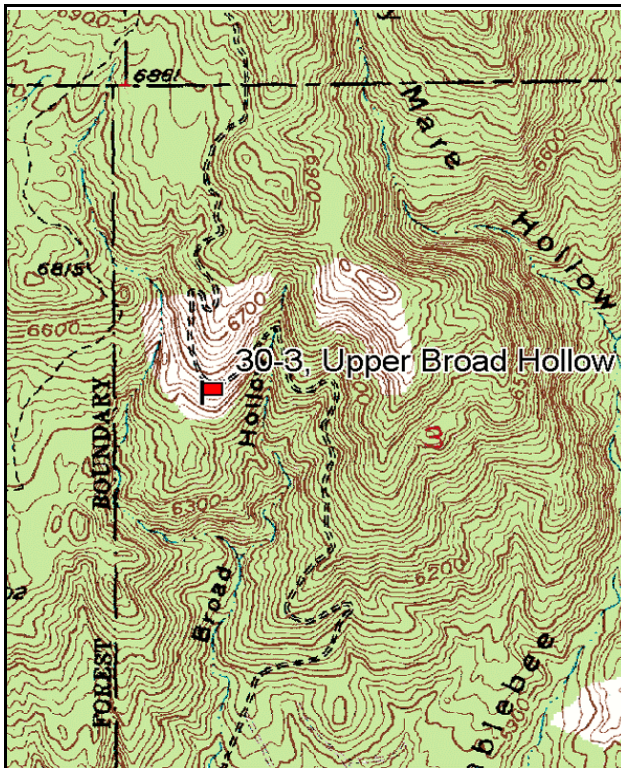
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 220 degrees magnetic. (Line 2 & 3, 0°M)

Frequency belt placement: line 1 (8 & 89ft), line 2 (34 & 71ft), line 3 (59ft). Rebar: belt 3 on 1ft.

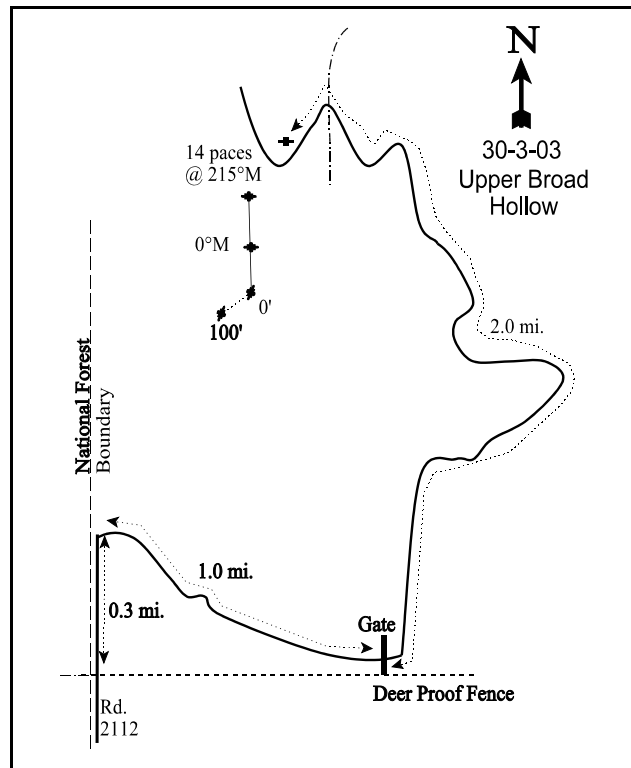
LOCATION DESCRIPTION

From the Dixie National Forest boundary, proceed north on Pace Draw Road (Road 2112) for 0.30 miles. Turn right onto Harmony Mountain Road and travel 1.0 miles, at which point there will be a gate. Go through the gate, turn left and travel 2.0 miles to a sharp right-hand turn in the road. On the southwestern side of the road is a witness post. Walk 14 paces at 215 degrees magnetic to the 300-foot stake. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height.



Map Name: Stoddard Mountain

Township 38S, Range 13W, Section 3



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4154971 N, 296258 E

DISCUSSION

Upper Broad Hollow - Trend Study No. 30-3

This site at Upper Broad Hollow is intermediate in elevation, but is still critical deer winter range. It is located about 3 miles north of the town of New Harmony on the Harmony Mountains. Elevation is 6,500 feet, just above the juniper-pinyon belt. The site has a southerly aspect and a steep slope of 35%. The range type is mixed mountain brush, which varies somewhat in composition depending upon slope, exposure, and micro-site characteristics. On steeper south or west slopes, mountain big sagebrush and antelope bitterbrush prevail. On more easterly slopes, there is more shrub-live oak and Utah serviceberry with considerable amounts of bitterbrush, and occasional clumps of Gambel oak. Deer use of the entire area, judging from levels of utilization and the number of pellet groups observed, is moderate to heavy. Data from the nearby DWR Broad Hollow pellet group transect taken from 1988 through 1992, indicated heavy deer use with an average of 75 deer days use/acre (185 ddu/ha), the highest average on the herd unit (Jense et al. 1992). A pellet group transect read along the trend study site baseline in 1998 estimated a high level of deer use at 110 deer days use/acre (272 ddu/ha). Deer use remained high at 87 days use/acre in 2003 (215 ddu/ha). No signs of livestock grazing were noted during either reading.

Soils are relatively shallow and very rocky, derived from limestone parent material. Effective rooting depth is estimated at just over 7 inches. Rocks are very common on the surface and within the soil profile. There is little bare soil exposed, therefore erosion is not a serious problem due to the abundant protective ground cover.

The key browse species are Utah Serviceberry, mountain big sagebrush, and antelope bitterbrush. Important secondary species would include curlleaf mountain mahogany. Mountain big sagebrush provides about 25% of the total browse cover on the site. It remained at a relatively stable density between 1982 and 1998 at around 2,300 plants/acre. Utilization has been moderate with little heavy use. Vigor has remained good on most plants and percent decadence increased slightly from 18% in 1982 to 24% by 1998. Reproduction was good with a steadily increasing proportion of young plants. Data from 2003 show a 25% decline in density. Use was mostly light, vigor good on most plants, but the number of decadent plants increased to 36%.

Bitterbrush displays heavier use, especially in 1992 when 69% of the plants were classified as heavily hedged. Data from 1998 indicated 55% of the bitterbrush were heavily utilized with an additional 32% moderately hedged. Density has ranged from 2,133 plants/acre in 1982 to 860 in 2003. Some of the differences in numbers between years may be due to problems counting individual plants of this relatively low growing sprawling shrub which had an average crown diameter of 4 feet in 2003. It is apparent however that the population has declined slightly since 1998. Average cover and strip frequency both declined slightly and 80 dead bitterbrush plants/acre were estimated in 2003. Young recruitment is good and adequate to maintain the population at current levels.

Utah serviceberry, curlleaf mountain mahogany, and shrub-live oak are mainly large, mature populations. Serviceberry was encountered in higher density with the much larger sample size used in 1998. The average mature plant was about 4 feet in height in 1998 and 2003. Utilization has been mostly light to moderate with some heavy use on certain plants. Vigor has been normal and percent decadence low during all readings. Reproduction has been adequate to maintain the population.

Occasional shrubs which occur on the site include true mountain mahogany, narrowleaf low rabbitbrush, grey horsebrush, broom snakeweed, yellowleaf silttassel, Colorado pinyon, and Utah juniper. Point-quarter data from 2003 estimated 28 pinyon and 40 juniper trees/acre. Average basal diameter was estimated at 7 inches for pinyon and 5.4 inches for juniper.

The herbaceous understory is diverse but only moderately abundant. Total grass cover was estimated at 24% in 1998 and only 11.5% in 2003. The most common species is mutton bluegrass which provided 54% of the total grass cover in 1998 and 57% in 2003. The annual, cheatgrass, is also common providing an additional 39% of the grass cover in 1998 but declining to 23% in 2003. All other grasses occur occasionally. Forbs are very diverse but the 18 species encountered in 1998 and 22 species counted in 2003 produced only 5% cover during these 2 readings. The only common species include false dandelion, milkvetch, tansy mustard, an annual *Gilia*, and storksbill.

1982 APPARENT TREND ASSESSMENT

Soil trend appears stable to declining. Erosion is ongoing but not greatly excessive, considering the character of the site. Vegetative trend is also stable but will depend in large part on future soil conditions. At present, browse populations seem healthy but static. Herbaceous understory conditions are fair but somewhat precarious. This is a relatively fragile site that could rapidly deteriorate if animal use, especially from livestock, were to become much more intense than it is now.

1992 TREND ASSESSMENT

The soil trend is slightly up due to increased total protective ground cover. Basal vegetative cover has increased along with a 59% decrease in bare soil. Trend for browse is down due to declining populations of mountain big sagebrush and especially bitterbrush. Bitterbrush declined 50% in density and percent decadence increased to 31%. The number of heavily hedged plants rose from 22% in 1982 to 69% in 1992, while the number of plants displaying poor vigor also increased (0 to 13%). Trend for herbaceous understory is stable with increased quadrat frequency for perennial grasses and decreased quadrat frequency of perennial forbs.

TREND ASSESSMENT

soil - slightly up (4)

browse - down (1)

herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil appears stable. Percent cover of bare ground declined slightly, but rock and pavement cover increased from 24% to 33%. Litter cover declined slightly. Trend for key browse species, mountain big sagebrush, bitterbrush and serviceberry, appear stable. Sagebrush displays a similar density, light to moderate use, good vigor, improved reproduction, and relatively low decadence at 24%. Bitterbrush also shows a similar density compared to 1992. Use continues to be moderate to heavy, but vigor has improved and percent decadence has declined from 31% to 14%. More serviceberry was picked up in the much larger sample used in 1998. It shows lighter use, good vigor, and low decadence. Trend for the herbaceous understory is mixed. Sum of nested frequency for perennial grasses has declined slightly, while frequency of perennial forbs has increased. Mutton bluegrass increased significantly in nested frequency, whereas bottlebrush squirreltail declined significantly. Overall, trend for the herbaceous understory is considered stable.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil remains stable with similar ground cover characteristics compared to 1998. There is good protective ground cover on the site leaving little unprotected bare soil. Trend for the key browse species, serviceberry, mountain big sagebrush, and bitterbrush, is mixed. Trend for serviceberry and bitterbrush is relatively stable. Utilization of both species is moderate to heavy yet vigor remains good and percent decadence low. Density estimates have declined for both species. However, it appears that density was overestimated in 1998 since cover numbers are similar between readings and few dead plants were sampled in 2003. Mountain big sagebrush shows a downward trend. Density has declined 25%. Use has remained mostly light and the proportion of decadent plants increased from 24% to 36%. This is still not unacceptably high even though 42% of the decadent plants sampled were classified as dying (>50% crown death). This equates to 240 plants/acre. Currently, young plants are not abundant enough to maintain the stand at current levels. With this in mind, trend for browse is considered down slightly. Trend for the herbaceous understory is down slightly. Sum of nested frequency has declined slightly for perennial grasses and more sharply for perennial forbs. The key grasses, mutton bluegrass and bottlebrush squirreltail, both declined significantly. One positive aspect of the grass composition is the significant decline in nested frequency of cheatgrass. Total herbaceous production was poor this year due to drought conditions. In 1998, total herbaceous cover was estimated at nearly 30% (24% grasses 5% forbs). During the 2003 reading, total herbaceous cover was estimated at only 16%. Total forb cover remained at 5% but total grass cover declined to only 12%. Part of the decline is due to the drop in cheatgrass cover, 9.5% to 3% cover, but cover of mutton bluegrass also declined by 50% (13% to 6.6%).

TREND ASSESSMENT

soil - stable (3)

browse - down slightly (2)

herbaceous understory - down slightly (2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 3

Type	Species	Nested Frequency			Average Cover %	
		'92	'98	'03	'98	'03
G	Agropyron cristatum	-	-	-	.03	-
G	Bouteloua gracilis	2	3	2	.15	.03
G	Bromus tectorum (a)	-	_b 264	_a 124	9.47	2.66
G	Festuca ovina	-	3	-	.00	-
G	Koeleria cristata	34	31	27	.81	.94
G	Poa fendleriana	_a 166	_b 216	_a 155	13.11	6.58
G	Sitanion hystrix	_b 118	_a 19	_a 26	.31	.90
G	Stipa comata	7	6	10	.36	.39
Total for Annual Grasses		0	264	124	9.47	2.66
Total for Perennial Grasses		327	278	220	14.79	8.85
Total for Grasses		327	542	344	24.26	11.52
F	Agoseris glauca	_a 6	_c 46	_b 26	.58	.18

Type	Species	Nested Frequency			Average Cover %	
		'92	'98	'03	'98	'03
F	Allium spp.	-	10	-	.04	-
F	Androstephium breviflorum	1	-	-	-	-
F	Arabis spp.	-	-	2	-	.00
F	Artemisia ludoviciana	_b 18	_a -	_a -	-	-
F	Arenaria macradenia	_a -	_a -	_b 16	-	1.09
F	Astragalus straturensis	7	-	-	-	-
F	Aster spp.	-	1	-	.00	-
F	Astragalus spp.	_b 32	_b 19	_a 5	.91	.04
F	Astragalus utahensis	-	-	-	.03	-
F	Castilleja linariaefolia	_b 23	_{ab} 6	_a 1	.06	.01
F	Calochortus nuttallii	-	-	2	-	.00
F	Collomia linearis (a)	-	_a -	_b 19	-	.37
F	Comandra pallida	-	-	5	-	.06
F	Collinsia parviflora (a)	-	_a 14	_b 53	.03	.55
F	Cymopterus spp.	-	8	-	.06	-
F	Descurainia pinnata (a)	-	57	67	.38	.99
F	Dichelostemma pulchellum	_a -	_b 33	_a -	1.55	-
F	Draba spp. (a)	-	2	6	.00	.01
F	Erysimum asperum	4	3	-	.03	-
F	Erodium cicutarium (a)	-	_b 13	_a -	.52	-
F	Eriogonum spp.	-	-	1	-	.00
F	Erigeron pumilus	1	8	7	.07	.18
F	Eriogonum racemosum	-	-	1	-	.00
F	Gilia spp. (a)	-	_a -	_b 103	-	1.01
F	Lappula occidentalis (a)	-	-	3	-	.00
F	Lactuca serriola	6	-	-	-	-
F	Microsteris gracilis (a)	-	_a 10	_b 30	.03	.12
F	Phlox hoodii	-	-	1	-	.03
F	Senecio multilobatus	-	-	4	-	.01
F	Sphaeralcea grossulariaefolia	-	6	4	.06	.04
F	Stephanomeria tenuifolia	16	16	8	.13	.19
F	Zigadenus paniculatus	-	3	1	.00	.00
Total for Annual Forbs		0	96	281	0.97	3.07
Total for Perennial Forbs		114	159	84	3.57	1.88
Total for Forbs		114	255	365	4.54	4.96

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 3

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Amelanchier utahensis	30	23	12.87	11.09
B	Artemisia nova	0	1	-	.15
B	Artemisia tridentata vaseyana	64	57	8.79	6.16
B	Chrysothamnus parryi	6	4	.30	1.32
B	Chrysothamnus viscidiflorus viscidiflorus	5	0	.15	-
B	Garrya flavescens	4	2	-	1.00
B	Gutierrezia sarothrae	1	3	-	.18
B	Juniperus osteosperma	1	1	.78	1.85
B	Opuntia spp.	3	5	.15	.15
B	Pinus edulis	3	1	2.99	3.12
B	Purshia tridentata	34	30	5.40	3.85
B	Quercus turbinella	4	2	.39	1.61
B	Tetradymia canescens	1	3	.03	.03
Total for Browse		156	132	31.87	30.53

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 3

Species	Percent Cover	
	'98	'03
Amelanchier utahensis	-	11.76
Artemisia tridentata vaseyana	-	5.96
Chrysothamnus parryi	-	.88
Chrysothamnus viscidiflorus viscidiflorus	-	.40
Garrya flavescens	-	.81
Juniperus osteosperma	5.00	8.00
Pinus edulis	3.59	3.98
Purshia tridentata	-	5.09
Quercus turbinella	-	1.53

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 30 , Study no: 3

Species	Average leader growth (in)
	'03
Amelanchier utahensis	1.2
Artemisia tridentata vaseyana	1.3
Purshia tridentata	1.4

POINT-QUARTER TREE DATA --
Management unit 30 , Study no: 3

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	31	40
Pinus edulis	26	28

Average diameter (in)	
'98	'03
7.2	5.4
8.2	7.0

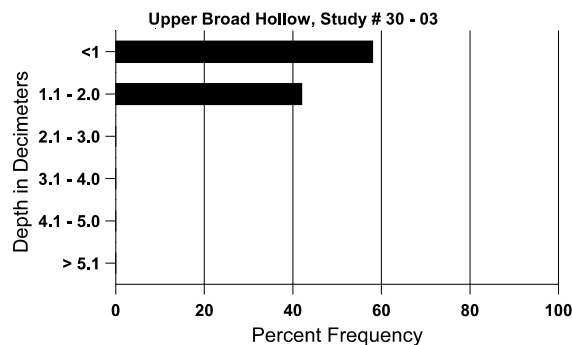
BASIC COVER --
Management unit 30 , Study no: 3

Cover Type	Average Cover %		
	'92	'98	'03
Vegetation	15.25	50.70	44.51
Rock	19.50	27.54	20.95
Pavement	4.25	5.34	3.90
Litter	51.75	45.95	47.70
Cryptogams	0	.03	0
Bare Ground	9.25	7.44	8.52

SOIL ANALYSIS DATA --
Management unit 30, Study no: 3, Study Name: Upper Broad Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
7.3	68.5 (12.3)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 3

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	29	10	-	-
Deer	59	32	110 (271)	87 (215)

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 3

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
82	200	-	-	200	-	-	33	0	0	0	33/41
92	333	-	133	200	-	-	0	40	0	0	34/36
98	1880	320	300	1480	100	240	27	2	5	2	50/55
03	740	20	220	500	20	40	32	11	3	0	51/72
Artemisia nova											
82	0	-	-	-	-	-	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	40	-	-	40	-	-	0	0	-	0	6/15
Artemisia tridentata vaseyana											
82	2599	-	200	1933	466	-	31	10	18	0	18/26
92	2198	66	266	1466	466	-	48	9	21	0	16/18
98	2300	120	360	1380	560	980	24	.86	24	8	20/30
03	1720	-	100	1000	620	640	10	0	36	15	21/30
Cercocarpus ledifolius											
82	133	-	-	133	-	-	0	0	-	0	47/51
92	66	-	-	66	-	-	0	100	-	0	106/106
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	60/40
Chrysothamnus parryi											
82	0	-	-	-	-	-	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	-	0	-/-
98	520	-	40	480	-	-	0	0	-	0	12/15
03	120	-	-	120	-	-	0	0	-	0	20/28

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus viscidiflorus viscidiflorus											
82	0	-	-	-	-	-	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	-	0	-/-
98	160	-	40	120	-	-	0	0	-	0	14/24
03	0	-	-	-	-	-	0	0	-	0	15/28
Garrya flavescens											
82	0	-	-	-	-	-	0	0	0	0	-/-
92	0	-	-	-	-	-	0	0	0	0	-/-
98	200	-	-	180	20	-	0	0	10	0	55/56
03	40	-	-	40	-	20	0	0	0	0	56/67
Gutierrezia sarothrae											
82	0	-	-	-	-	-	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	-	0	10/15
03	100	-	-	100	-	-	0	0	-	0	12/17
Juniperus osteosperma											
82	0	-	-	-	-	-	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	-	0	-/-
03	20	-	-	20	-	-	0	0	-	0	-/-
Opuntia spp.											
82	199	-	-	133	66	-	0	0	33	0	3/8
92	200	-	-	200	-	-	0	0	0	67	6/8
98	60	-	-	60	-	-	0	0	0	0	5/11
03	100	-	-	100	-	-	0	0	0	0	7/15
Pinus edulis											
82	0	-	-	-	-	-	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	-	0	-/-
98	60	-	20	40	-	-	0	0	-	0	-/-
03	20	20	-	20	-	-	0	0	-	0	-/-
Purshia tridentata											
82	2133	-	-	2133	-	-	31	22	0	0	24/32
92	1066	-	333	400	333	-	13	69	31	13	20/35
98	1320	100	80	1060	180	40	32	55	14	5	26/39
03	860	20	100	680	80	80	44	30	9	7	27/50

		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Quercus turbinella											
82	266	-	66	200	-	-	0	0	0	0	45/55
92	399	-	133	66	200	-	17	50	50	0	39/47
98	120	-	60	60	-	-	0	0	0	0	36/40
03	40	-	-	40	-	-	0	0	0	0	23/43
Tetradymia canescens											
82	0	-	-	-	-	-	0	0	0	0	-/-
92	0	-	-	-	-	-	0	0	0	0	-/-
98	20	-	-	20	-	-	0	0	0	0	7/8
03	60	-	-	40	20	-	0	0	33	0	13/13